PREPRODUCTION INITIATIVE-NELP
REDUCED-GLYCOL DEICING SYSTEM
TEST PLAN

SITE: NAS BRUNSWICK

1.0 OBJECTIVE

This test plan describes the data collection procedure for the Reduced-Glycol Deicing System. These data will be used to determine the efficiency, effectiveness, and overall success of the system's ability to deice aircraft while minimizing the amount of glycol discharged to the environment. This system will be evaluated on its ability to:

- Reduce glycol discharge associated with aircraft deicing.
- Handle a range of weather conditions and aircraft configurations with minimal operator discretion.
- Reduce costs associated with deicing by minimizing glycol use and reducing associated waste disposal costs.

2.0 BACKGROUND/DESCRIPTION

Three states (Nebraska, Ohio, and New York) have mandated zero discharge of glycol-based deicing fluids into storm drains, and other states are expected to enact similar mandates in the future. In anticipation of this, Navy facilities using glycol deicing equipment have been investigating alternatives for capturing the runoff from their operations and either piping it to a local publicly owned treatment works (POTW), treating it in an onsite treatment system, or paying to have it hauled away and treated offsite. In practice, most POTWs and Navy owned treatment works (NOTWs) will not accept this wastewater because of its extremely high strength (approximately 3,000 times that of municipal wastewater). Consequently, only the last two options are available to most deicing operations. Because of the high cost of these options, the cost of purchasing deicing fluid, and the potential negative impact of glycol discharges on the environment, it is in the best interests of the Navy to minimize the volume of propylene glycol (or ethylene glycol) used in its deicing operations.

To achieve this goal, the Pollution Prevention Equipment Program (PPEP) is conducting a technology demonstration of the Reduced-Glycol Deicing System, a hybrid forced-air/propylene glycol deicing vehicle. It is expected that the system's improved efficiency and reduced glycol usage during deicing activities will result in cost savings and eliminate a portion of the waste caused by current deicing practices. Equipment testing will occur at Naval Air Station (NAS) Brunswick.

Currently, operators must assess weather conditions before starting deicing operations. The operator consults a chart that plots the water/glycol mix for the conditions. The truck operator then adjusts the proportioning valve of the deicing vehicle to the ratio

specified on the chart (usually between 30- and 70-percent glycol in the glycol/water mixture). This causes the truck's glycol dispensing system to mix glycol and water (stored separately in the truck's two storage tanks) according to the set ratio. The current system's need for operator discretion in determining the correct mix has resulted in excess glycol use from time to time. Using the current system, an average of two aircraft can be deiced with a fully loaded truck (1200 gallons of water and 600 gallons of glycol).

With the proposed system, glycol and water are mixed together as they are added to the truck's deicing fluid storage tank. The ratio of the mixture is determined based on current weather conditions, and the mixing is performed before the truck departs for the deicing activity. During deicing, the mixed deicing fluid is dispensed as a pressurized stream within a stream of heated air. The proposed system also allows the airflow-to-glycol ratio to be adjusted according to weather and aircraft conditions. It is projected that using heated air in conjunction with the deicing fluid will reduce the amount of glycol waste generated by deicing. The proposed system is also expected to reduce waste because it can handle a wider range of weather conditions at each setting. Furthermore, while current practices use substantial amounts of glycol to remove accumulated snow, it is expected that the proposed system will achieve similar snow removal using hot air only.

2.1 Equipment Description

The proposed system consists of a deicing truck with an enclosed cab and a hybrid air/glycol delivery nozzle. The hybrid deicing system uses a coaxial nozzle to produce a stream of deicing fluid within a forced air stream. Both streams exit the nozzle at high velocity and work in tandem to sweep away frozen precipitation from aircraft surfaces.

The hybrid system differs from the conventional in that a centrifugal-type air compressor and forced air delivery system have been added, and the fluid pump is replaced by a high-pressure triplex pump. Together, the air compressor and the triplex pump allow the coaxial nozzle to produce the two-phase stream of glycol within air. The operator can adjust the flow rates of each stream component to meet the deicing needs of a particular situation. The ability to adjust these settings allows for optimal performance of the system over a wide range of deicing conditions. The system can be set in the following modes:

- 100 pounds per minute (ppm) air at 13 pounds per square inch (psi)
- 100 ppm air at 13 psi and 9 gallons per minute (gpm) deicing fluid at 7,000 psi
- 100 ppm air at 13 psi and 20 gpm deicing fluid at 3,000 psi
- 9 gpm deicing fluid at 7,000 psi without air
- 20 gpm deicing fluid at 3,000 psi without air.

3.0 TEST PROCEDURES/APPROACH

This test plan will be used to evaluate the effectiveness of the Reduced-Glycol Deicing System in reducing the volume of glycol deicing waste generated and the total cost of the glycol deicing operation.

To evaluate the effectiveness of the reduced glycol system relative to the current deicing equipment, side-by-side tests will be conducted—one unit will be used on the right side of an aircraft and the other unit on the left. These tests will provide data on comparative glycol usage and labor requirements and will remove weather and aircraft-specific requirements as variables. Baseline and test project data will be gathered by examining the Deice/Glycol Request forms (example attached) that are currently completed by NAS Brunswick personnel. These forms will provide the quantitative and qualitative data used in an analysis of the usability and cost-effectiveness of the reduced glycol unit. Repair and service cost data for both the reduced glycol system and the current system will be gathered from relevant vendor and NAS Brunswick records.

4.0 REPORTING

The Deice/Glycol Request forms are a concise method of data collection. In addition, NAS Brunswick personnel are familiar with these forms. One form should be filled out each time a deicing request is received or a deicing event occurs. Data will be collected for 6 months (or as long as deicing activities are required). During this time, periodic status reports on the testing and completed Deice/Glycol Request forms will be faxed. The collected data will be used to develop a final report that will include detailed results and observations, assess the efficiency and cost-effectiveness of the unit, and evaluate its ability to interface with site operations.

DEICE/GLYCOL REQUEST

Control number: _____

Date: _____`
Call received by: _____
Time call received: _____ Requested deice time: _____ Launch time: _____
Organization: _____ A/C type & side number: _____
Requester (name/rate): _____ Location (Spot #): _____
Mission type (SAR, Operational, NALO, Train, FCF, etc.): _____ **PRIORITY: I II III IV**

AIRCRAFT/USAGE INFORMATION

Boom operator (name/rate): _____ SE license number: _____
Was aircraft ready: Yes ☐ No ☐ Wings swept: Yes ☐ No ☐ SE clear of acft: Yes ☐ No ☐
Areas deiced: Nose ☐ Fuselage ☐ Wings ☐ Props ☐ Tail ☐
Other (specify): _____

FLIGHT ENGINEER/DEICER RELEASE

Comments: _____

Name/Rate: _____ Signature: _____
(Print)

DEICE/USAGE INFORMATION

Driver: _____ Deicer #: _____ AIMD Safety Observer: _____
Time departed: _____ Time arrived A/C: _____ Temperature: _____ Wind speed (knots): _____
Weather cond.: Clear ☐ Freezing fog/drizzle ☐ Light freezing rain ☐ Light snow ☐ Heavy snow ☐
Deice started: _____ Glycol % setting: _____ Deice completed: _____ Glycol used (gal): _____
Comments/Problems: _____

continue on back

SERVICING INFORMATION

FLUIDS REPLENISHED: Glycol: _____gal Water: _____ gal Diesel: _____ gal Oil: _____qt
Deicer RFU: Yes ☐ No ☐ MAF MCN: _____ Time servicing completed: _____
Comments/Discrepancies: _____

Name/Rate: _____ Signature: _____ Observer: _____
(PRINT)

CANCELLATION

CANCELED BY (name/rate): _____ Phone #: _____ Time: _____

Reason: _____

ROUTING

PC Supervisor: _____ Leading Chief: _____ Division Officer: _____ AZ: _____(File)
Encl. (3)